

### **REMARKS/ARGUMENTS**

Claims 11 to 16 and 18 to 20 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sabol et al. (EP 0 085 553). Claim 17 was rejected under 35 U.S.C. §103(a) as being unpatentable over Sabol et al. (EP 0 085 553) as applied in 103 rejection above, in view of Armand (U.S. 4,108,687).

Claim 11 has been amended.

Reconsideration of the application is respectfully requested.

#### **35 U.S.C. 103(a) Rejections based on Sabol et al.**

Claims 11 to 16 and 18 to 20 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sabol et al. (EP 0 085 553).

Sabol et al. discloses “zirconium alloy intermediate and final products, and processes for their fabrication.” (Page 1, lines 1 to 3).

Claim 11 has been amended to recite “a method for producing a zirconium alloy semi-finished product containing by weight at least 97% zirconium, intended for the production of at least one elongated product, comprising:

casting the zirconium alloy to produce an ingot with a diameter between 400 mm and 700 mm and a length between 2 m and 3 m;

two-stage forging the ingot to produce the semi-finished product intended to be formed to obtain the elongated product, wherein a first forging stage of the ingot is performed at a temperature at which the zirconium alloy is in a state comprising the crystalline  $\alpha$  and  $\beta$  phases of the zirconium alloy, wherein a second forging stage follows the first forging stage, wherein  $\beta$  quenching does not occur between the first and second forging stage; and

extruding or hot rolling the forged ingot.” Support can be found on page 8 and 9, discussing cooling from the  $\alpha + \beta$  phase to the  $\alpha$  phase or keeping the temperature in the  $\alpha + \beta$  phase, for example.

Sabol et al. does not teach or show “wherein  $\beta$  quenching does not occur between the first and second forging stage,” as recited in claim 11. Sabol  $\beta$  quenches after the initial forging. (See page 2, line 11 to 16).

Furthermore, the intermediate  $\beta$  quenching and Sabol's second forging process identified in the Final Office Action would not be suitable for ingots of the claimed size and it is respectfully submitted that one of skill in the art would never use Sabol's second forging process with such ingots due to hydride formation. The intermediate quenching of Sabol would imply a long reheating at a high temperature similar to the one which takes place in the prior art referenced in the specification, for bringing the ingot to a 1,000 to 1,100° C, about which the specification of the present invention says that it causes a hydride formation. Also, hydrides may be formed during the quenching itself, due to the hot product coming into contact with water. One of skill in the art would know that the quantity of hydrides formed at this stage would not be negligible for ingots of the claimed size.

One of skill in the art would not use different quenching media, as suggested by the Examiner. Other quenching media are not adequate enough in terms of quenching speeds. Water is the only possible medium sufficient to be used for  $\beta$  quenching, however has the drawbacks of hydride formation as discussed above. Moreover, the quenching operation itself is not the main source of hydride formation, but rather the long heating step which precedes  $\beta$  quenching since water is captured from the atmosphere during heating. Therefore even if you were to change the quench media, this would only partly solve the hydride formation problem as the long heating step prior to  $\beta$  quenching contributes to the hydride formations.

Withdrawal of the rejections to claim 11 and the dependent claims 12 to 16 and 18 to 20 under 35 U.S.C. § 103(a) as being unpatentable over Sabol et al. thus is respectfully requested.

### **35 U.S.C. 103(a) Rejections in view of Armand et al.**

Claim 17 was rejected under 35 U.S.C. §103(a) as being unpatentable over Sabol et al. (EP 0 085 553) as applied in 103 rejection above, in view of Armand (U.S. 4,108,687).

Sabol et al. is discussed above.

Armand et al. discloses a method for treating zirconium and zirconium alloys. "The method consists in dissolving or maintaining a solid solution of the majority of carbon contained in these alloys by thermal or thermo-mechanical treatments carried out in the  $\alpha + \beta$  range or if necessary in the  $\beta$  range followed by a rolling in a phase if necessary." (See Abstract).

Claim 17 recites “wherein a second forging stage is performed at a temperature at which the zirconium alloy of an intermediate product obtained at an end of the first forging stage of the ingot is in a state comprising crystalline  $\alpha$  and  $\beta$  phases of zirconium alloy.”

In light of the discussion above, the rejection to dependent claim 17 under U.S.C. §103 is respectfully requested.

Furthermore, Armand et al. fails to teach or show “two-stage forging the ingot to produce the semi-finished product intended to be formed to obtain the elongated product, wherein a first forging stage of the ingot is performed at a temperature at which the zirconium alloy is in a state comprising the crystalline  $\alpha$  and  $\beta$  phases of the zirconium alloy, wherein a second forging stage follows the first forging stage, wherein  $\beta$  quenching does not occur between the first and second forging stage,” as recited in claim 11. The Advisory Action cites two forging operations of Sequence 2, however the applicant does not see such. Armand et al. Col. 4, lines 35 to 41 teaches Sequence 2 having a “forging” process and a “rolling” process. The second treatment is not a forging but rather a succession of hot-rolling steps. As previously discussed in prior responses, forging and hot rolling are not equivalent. Forging leads to a sequential deformation of the material, by crushing and the porosities which possibly exist in the ingot tend to get closed during forging. Hot rolling on the other hand leads to a continuous deformation of the material by traction and the porosities tend to get opened during hot rolling contrary to forging.

In addition, Armand et al. also uses ingots that are much smaller than the present invention. (See Armand et al. Col. 4 lines 31 to 34). The current invention is patentably distinct under MPEP 2144.04, because the change in dimensions impacts the methods used. The method of production of alloys with the claimed dimensions is not similar to what is performed in the prior art. Therefore it would not have been obvious for one of skill in the art to combine Sabol et al. and Armand et al. The Advisory Action cites routine optimization however; the change in dimensions may change the process and methods used. Sabol does reference changing dimensions, however, as noted in Sabol, this impacts the method used. Furthermore there is no motivation to combine Sabol et al. and Armand et al. Sabol et al. provides improved long term corrosion resistance in high temperature steam environment. (Page 1, lines 6 to 7). Armand et al. provides an increase in strength and resistance to creep, however this is not motivation to combine the references.

Withdrawal of the rejection to dependent claim 17 under U.S.C. §103 for these reasons as well is respectfully requested.

**CONCLUSION**

The present application is respectfully submitted as being in condition for allowance and applicants respectfully request such action.

Respectfully submitted,

DAVIDSON, DAVIDSON & KAPPEL, LLC

By: \_\_\_\_\_



William C. Gehris

Reg. No. 38,156

Davidson, Davidson & Kappel, LLC  
485 Seventh Avenue  
New York, New York 10018  
(212) 736-1940